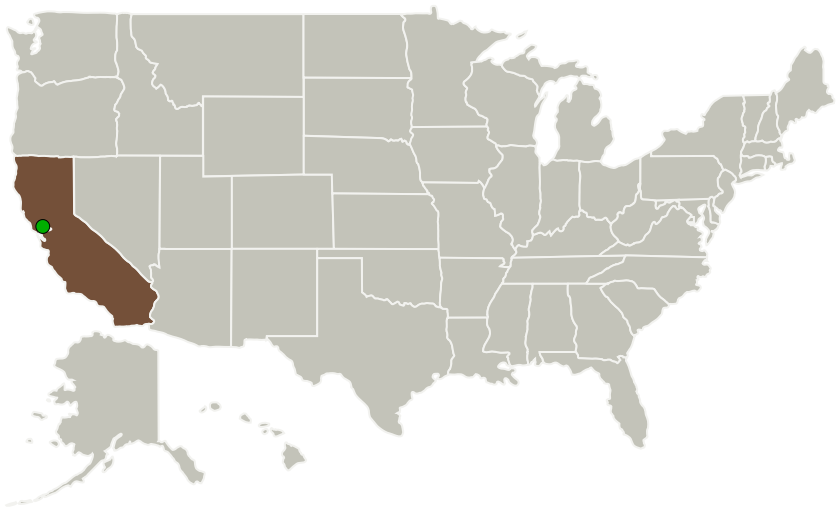
Pneubotics - Membrane-Based Robotics for Remote Material Handling, Phase I

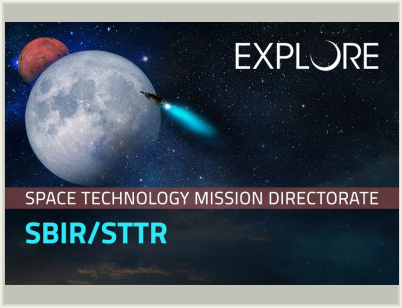
Completed Technology Project (2014 - 2014)

Project Introduction

We have invented a new class of robotics, called `Pneubotics', that rival current manipulators in payload and reach at 1/10th the weight. Our technology leverages insights into lightweight materials and mass manufacturing to create robots that derive power, structure, and movement from pressurized air. As a result, drive trains, motors, bearings, shafts, sliding surfaces, and excess structural material are eliminated, leading the way for robots that exhibit extremely high strength to weight ratios, inherent human safe operation, and high degrees of freedom at comparatively low part count. This transformative new technology has the potential to enable the widespread use of automated material handling on missions beyond low earth orbit. The compliant nature of these robotic systems allows them to robustly grasp arbitrarily shaped objects and make them ideal for operating around sensitive equipment or cooperatively with humans. Similarly, due to their fluidic architecture they can be deflated and stowed for efficient transport. The work described in this phase I SBIR proposal aims to develop the key technological components that will allow the production of Pneubotic systems, including novel pressure vessel based fabric actuator design, a pneumatic power architecture that exceeds electromagnetic efficiency, and dynamic models of inflated fabric structures. These components will enable the construction of a full prototype manipulation system in phase II.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Otherlab, Inc.	Lead Organization	Industry	San Francisco, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Transitions

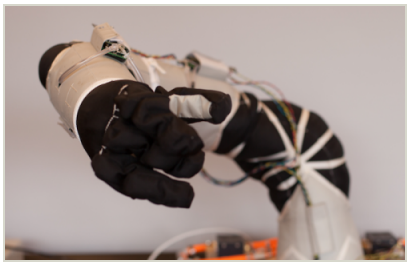
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140537)*

Images



Briefing Chart
Pneubotics - Membrane-Based Robotics for Remote Material Handling, Phase I
(https://techport.nasa.gov/image/127353)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Otherlab, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

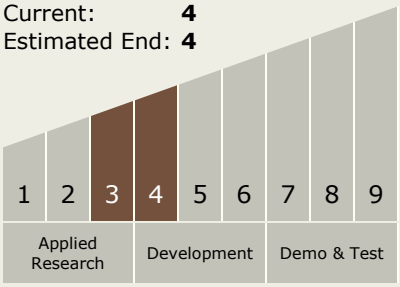
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Kevin B Albert

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.1 Sensing and Perception
    - TX04.1.3 Onboard Mapping and Data Analysis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System